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Optimal selling point and production efficiency of Catfish farmers in Onicha Local Government Area of Ebonyi State, Nigeria

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ABSTRACT

The study determined the optimal selling point and production efficiency of catfish farmers in Onicha Local Government Area of Ebonyi state, Nigeria. Simple random sampling technique was used in the selection of 60 respondents for the study. Data collected were analyzed using descriptive statistical tools, cost and returns analysis and production function. The farmers had net profit of ₦1,059,399, ₦3,010,411 and ₦5,476,399 for fingerlings, juvenile and table size stages of catfish farming respectively with a total net profit of ₦9,546,209. The result for production efficiency from the Maximum Likelihood Estimation (MLE) revealed that labour, capital, number of fish pond, education and income significantly influenced production efficiency of catfish farmers in the study area. While age contributed negatively to production inefficiency at 1% level of probability. In the efficiency distribution, majority of the

traditional processors had their efficiency scores above the mean of 0.960, indicating that catfish farmers in the study area were efficient in the production of catfish. Result on constraints affecting optimal sales of catfish showed that high cost of input, inadequate extension visit, limited sales, financial constraint, Lack of credit facilities, inadequate harvest equipment, inadequate transport facilities, high cost of feeding, high cost of labor and high mortality rate were the major constraints affecting optimal sales of catfish in the study area. It is recommended that catfish farmers should sell out their stock at table size for more sales.

Keyword: sales, production, catfish, stages

1. INTRODUCTION

The increase in human population coupled with large numbers of undernourished people, especially in developing countries, have made the need for food production especially animal protein a major worldwide issue of concern (Okechi, 2004). Many Nigerians suffer from protein deficiency due to low animal protein intake (Emmanuel and Omotoriogun, 2010). According to Ojo (2008), a small amount of fish is an important dietary supplement for people who cannot easily afford other sources of animal protein. Fish is therefore considered a good source of dietary protein for most Nigerians. Catfish is high in vitamin D. Farm-raised catfish contains low levels of omega-3 fatty acids and a much higher proportion of omega-6 fatty acids.

The major challenge facing fish enterprises in Nigeria is the ability to ensure the maximum utilization of inputs to ensure the desired level of inputs. The total variable cost of a catfish farmer is the expense associated with the production of catfish from fingerlings to maturity. They include cost of fingerlings, feed, Labour, drugs and fertilizer. Low returns on investment could be attributed to use of poor quality fingerlings, high cost of feed, inadequate finance as catfish farming is capital intensive, inadequate information, traditional techniques, poor infrastructural facilities, small size of holdings and low capital investment as identified by Ugwumba and Nnabuife, (2008). Kehinde, Omitoyin, Agbola, Awotide, and Oke (2009) in their research made a clear statement that aquaculture production in Nigeria has been steadily increasing since the beginning of the 21st century.

Although statistics indicate that Nigeria is the largest African aquaculture producer with production output of over 154,890 tonnes per annum which grew to 800,000 tonnes per annum in 2008 (Fison, 2008), this has been unable to meet the market demand in Nigeria which according to Inside Nigeria Fish report (2006), increased from over 1 million tonnes per annum in 2006 to 2.66 million tonnes per annum in 2009. Consequently the country has become a major importer of fish products given its ever increasing consumption and insufficient internal sources, leading to considerable imports which accounted for more than 800,000 tonnes in 2009 (Rondom and Nzeka, 2010). As a result of the struggle by catfish farmers to meet up with the cost of their investment, breakeven and make profit; it is very pertinent to determine the best stage the farmers can sell in order to optimal enterprise profitability. The specific objectives were to identify the stages and costs involved in Catfish production based on the capacity of the farmers, analyze the production efficiency of the catfish farmers and identify the constraints to the attaining the optimal selling point by the catfish farmers.

2. METHODOLOGY

This study was conducted in Onicha Local Government of Ebonyi State, Nigeria. It has an area of 476 km^2 and has a population of 236,828 according to the 2006 census. Its headquarters are in the town of Isu. Other major towns in the Area Council aside Isu the headquarters and Onicha Igbo-Eze are Oshiri, Ukawu and Aba-Omege. Despite their original names being identical, Onicha should not be confused with the major city of Onitsha located in Anambra State in Nigeria.

Sampling Technique

Random sampling technique was used to select 60 catfish farmers out of the list of registered catfish farmers that was obtained from the Agriculture Department in the Area Council. The names were shuffled together and 60 catfish farmers were randomly selected through balloting.

Method of Data Collection

Data were collected from primary sources through the use of structured questionnaire with the help of trained enumerators. The questionnaires were distributed to the selected catfish farmers in Ebonyi State.

Method of data analysis

The analytical techniques used to analyze the data collected for the study includes descriptive statistics, cost and return analysis and production efficiency model.

Model Specification

Budgetary analysis model

The budgetary technique formulation is given as;

$GM = \sum p_i q_i - \sum r_j x_j$ ...1

Where:

GM = gross margin (total revenue –total variable cost)

p_i = Unit price of output $_i$

q_i = quantity of output $_i$

r_j = unit cost of the variable input $_j$

x_j = quantity of the variable input $_j$

The explicit form of the Cobb-Douglas stochastic frontier production function employed in the study is expressed as:

$\ln Y = \beta_0 + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \beta_4 \ln X_4 + Vi - Ui$ ...2

Where:

Y= Quantity of output (Kg)

X_1 = pond size (m2)

X_2 = Labour in man-days

X_3 = cost of fingerlings (N)

X_4 = quantity of feeds (Kg)

β_0 = Intercept

β = Vector of the coefficients for the associated independent variables in the production function

Ui = one-sided component, which captures deviation from frontier as a result of efficiency of the firm Vi = effect of random stocks outside the firm control, observation and measurement error and other stochastic (noise) error term. The technical inefficiency model is expressed as:

$Ui = \delta_0 + \delta_1 Z_1 + \delta_2 Z_2 + \delta_3 Z_3 + \delta_4 Z_4 + \delta_5 Z_5 + \delta_6 Z_6 + \delta_7 Z_7$ ...(3)

Z_1 = age (years)

Z_2 = education (years of formal schooling)

Z_3 = household size

Z_4 = years of farming experience (years)

Z_5 = number of contact with extension agents per cropping season (number of contacts) Z_6 = member of cooperative (years)

Z_7 = amount of credit obtained (naira)

δ_1 δ_7 - = are the scalar parameters to be estimated.

3. RESULTS AND DISCUSSION

Stages and costs involved in Catfish production based on the capacity of the farmers

Estimates of costs and returns of the various stages of catfish production were calculated using average cost (fixed and variable) and yield data generated from each of the sampled fish farmers of an average capacity 800 fish per fish pond.

Table 1 Cost analysis of the various stages of catfish production

Items Amount (₦)	Fingerlings Amount (₦)	Juvenile Amount (₦)	Table size in naira	Total Amount (₦)
Revenue				
Sales		7,210,300	12,468,000	25,878,300
Total revenue	6,200,000	7,210,300	12,468,000	25,878,300
Variable cost				
Cost of stocking	211,456	198,200	121,661	531317
Pond liming/salting	20,000	15,000	32,000	67,000

Labour	134,805	104,805	73,800	313410
Pond maintenance	150,000	120,000	155,000	425000
Feeding	560,000	660,000	980,000	2,200,000
Medication	58,000	45,000	76,000	179,000
Water	10,000	18,500	38,000	66,500
Transportation cost	93,000	108,155	187,020	388,175
Cost of processing	-	-	750,000	750,000
Other variable cost	69,200	56,210	45,200	170,610
Total variable cost	1,306,461	1,325,870	2,458,681	5,091,012
Fixed cost				
Pond construction	1,300,000	1,280,000	1,230,000	3,810,000
Cost of net	56,000	45,600	34,500	136,100
Equipment (weighing Scale, Sieve, net,				
bucket, e.t.c).	1,000,000	804,420	932,420	2,736,840
Water pump	800,000	650,000	1,500,000	2,950,000
Dryer	550,000	360,000	740,000	1,290,000
Other fixed cost	128,140	94,000	96,000	318,140
Total fixed cost	3,834,140	2,874,020	4,532,920	11,241,080
Total cost	5,140,601	4,199,890	6,991,601	16,332,092
Gross profit	4,893,539	5,884,431	10,009,319	20,787,289
Net profit	1,059,399	3,010,411	5,476,399	9,546,209
Return per Naira	0.1709	0.4175	0.4392	1.0276
Source: Computed from field survey data, 2018. The fingerlings and juveniles were measured in numbers while the table size were measured in kilogram				

The cost and return analysis in Table 1 revealed that sales of fish at table size, juvenile and fingerling stage generated revenue of ₦12,468,000, ₦7,210,300 and ₦6,200,000 with total revenue of ₦25,878,300. This implied that sales of catfish at table size generated more profit to the farmers at ₦12,468,000. Table 1, further revealed that fixed cost (₦11,241,080) accounted for the largest proportion of total cost in the study area when compared to variable cost ₦5,091,012. This shows that large amount of money spent by fish farmers in the study area were majorly for Pond construction, net, equipment, dryer and other fixed cost.

Also, the result shows that an average total cost (TC) of ₦16,332,092 was incurred while total revenue (TR) of ₦25,878,300 was realized with a gross margin (GM) of ₦20,787,289 and a net profit of ₦9,546,209 with a return rate of ₦1.03 which implied that for every ₦1.00 invested, ₦1.03kobo was gained by the respondents.

Production efficiency estimates of the catfish farmers

The maximum likelihood estimates of the parameters for the models estimated for catfish farmers in the study area is presented in Table 2; the results from the production efficiency estimates indicated that labour and capital were positively significant to sales efficiency at 1% level of probability.

Table 2 Maximum likelihood estimate (MLE) of the stochastic frontier production function for catfish farmers in the study area

Variable	Coefficient	Std. Error	t statistics
Constant (β_0)	0.3437	0.1064	3.230**
Education ($\beta_{1)}$	0.4884	0.1531	3.191**
Labour ($\beta_{2)}$	0.4836	0.9930	4.870***
Number of fish pond (β_3)	-0.4794	0.1149	-4.174***
Capital (β_4)	0.2331	0.5254	4.436***
Income (β_5)	-0.3401	0.1009	-3.372**
Sales inefficiency model			

Sex (D_1)	0.1801	0.1504	1.197
Age (D_2)	-0.1655	0.1719	-9.628***
Marital status (D_3)	-0.1315	0.1100	-1.195
Occupation (D_4)	-0.7804	0.7266	-1.074
σ^2	0.7568	0.1682	4.499***
Γ	0.2080	0.1416	1.469
Log likelihood function	-2.119		

Source: computed from field survey data, 2018.

***,** *and** statistically significant at 1%, 5% *and*10% respectively.

This explained the fact that labour and capital input utilized in the production of catfish determined, to a very large extent contributed to the yield of catfish obtained. This could be because high level of labour and capital would improve productivity; processing and marketing which would lead to higher sales. Onoja and Achike (2011) as well as Alowode and Jinad (2014) found that capital positively influence the production of catfish while labour had a negative influence on catfish production.

Number of fish pond had negative significance on catfish production at 1% level of significance; this suggested caution in the number of fish pond, so as not to exceed its marginal productivity. This finding disagrees with the report of Ohen *et al.* (2009) which stated that higher as the space occupied by each catfish in terms of water volume is reduced, cannibalism becomes frequent and struggle for feed is increased which results in high mortality rate and thus has an adverse effect on output.

Education was positively significant at 5% level of probability which indicated that education of catfish farmers increased sales from catfish production. This implies that access to education and information on aquaculture increased the farmer's efficiency in catfish production. This finding negated the finding of Akenabor (2015) that education contributed to inefficiency of catfish farmers.

Income of the farmer negatively influenced efficiency of farmers at 5% level of probability. This indicated that increase in farmer's income would lead to decreased sales efficiency. This could be due to the fact that farmers may decide to invest more capital on the other occupation with increased income. This finding could be linked to the high involvement of respondents in vocational activities. This result disagrees with the report of Abdullahi, Kolo and Mahmud (2016) which stated that farmers augment farm production with income from other occupation.

The coefficient of age contributed negatively to sales inefficiency at 1% level of probability, thus, as age increases, farmers tend to be more productive and make more sales which implied that as fish farmers grew older, their sales efficiency increased as well. This finding disagrees with the finding of Akenabor (2015) but however, agreed with the findings of Esobhawan (2007) that age was a positive contributor to technical efficiency.

The sigma squared (σ^2) which is an indication of goodness of fit was statistically significant at 1% level, showing the goodness of it of the survey data with the model used and the correctness of the specified distributional assumption of the composite error term. The estimated value of gamma (γ) (0.2080) was significant at 1%.

Efficiency estimates for catfish Farmers in Onicha local government area of Ebonyi state.

Frequency distributions of sales efficiency scores as well as the means are reported in Table 3 for catfish producers in the states. The result showed that catfish producers had a mean efficiency score of 0.960. The minimum efficiency score was 0.8659 and a maximum of 0.9881.

Table 3 Distribution of sales efficiency estimates for catfish farmers in the study area

Efficiency estimates	Frequency	Percentage
≤ 0.899	4	6.67
0.900 - 0.920	5	8.33
0.921 - 0.940	3	5
0.941 - 0.960	7	11.7
≥ 0.961	41	68.3
Mean	0.960	
Max	0.9881	
Min	0.8659	

Source: Field survey data, 2018.

The result revealed that majority (68.3%) of the farmers had efficiency above the mean efficiency score (≥ 0.961), except for 19 respondents whose efficiency scores were fairly distributed from 0.87 – 0.958. This implied that majority of catfish farmers in the study area attained efficiency. The high efficiency recorded in this study implied that catfish producers in the study area used efficient equipments and technology for catfish production. However, there existed little chance to improve efficiency of the processors given their present state of technology, in order to attain a maximum efficiency of 1. Ogundele & Okoruwa (2006) and Aboki (2015) also reported such high efficiencies among rice farmers and groundnut processors respectively.

Constraints to optimal selling point of catfish

Descriptive statistics was used identify the constraints to optimal selling point of catfish in the study area. The table 6 reveals that the serious constraints affecting optimal sales of catfish with a mean of 2.0 and above were; high cost of input (2.03), inadequate extension visit (1.73), limited sales (1.75), financial constraint (2.20,), Lack of credit facilities (2.18), inadequate harvest equipment (2.63), inadequate transport facilities (1.93), high cost of feeding (3.10), high cost of labor (2.33) and high mortality rate (1.78).

This is in line with the result of Akenbor et al. (2015) which indicated that the serious problems of catfish production were; high cost of feed, limited of capital, high cost of pond construction, increased price by middlemen.

4. CONCLUSION

Based on the findings of this study, it was concluded that catfish farming in Onicha local government area of Ebonyi state is profitable. The factors affecting sales efficiency of catfish farmers were labour, capital, number of fish pond, education, income and age. Majority of the farmers (41%) were technically efficient in the use of resources. High cost of input, inadequate extension visit, limited sales, financial constraint, Lack of credit facilities, inadequate harvest equipment inadequate transport facilities, high cost of feeding, high cost of labor and high mortality rate were the constraints faced by catfish farmers in the study area.

Recommendations

1. Considering the higher profitability realized from sales of catfish at table size, catfish farmers are thus advised to sell out their stock at table size.
2. Considering the profitability of catfish production indicated in table 1, farmers and young entrepreneurs with low income are advised to engage in catfish production in order to increase their income.
3. Considering the positive contribution of labour to the efficiency of catfish farming in the study area, farmers are advised to consider increasing their labour force in the production and sales of catfish.
4. Based on the high equipment and input requirement of catfish production as identified in Table 3, the government should support catfish producers in the study area by supplying these equipments to them. Also commercial and other agricultural institutions should provide agricultural credit support to catfish farmers with which they can purchase the required inputs.

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Data and materials availability: All data associated with this study are present in the paper.

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